

Combined Heat and Power (Cogeneration)

ENERGY STAR[®] Award and CHP Certificate of Recognition

The United States Environmental Protection Agency (EPA) and the United States Department of Energy (DOE) recognize cost-effective, high-efficiency combined heat and power (CHP) projects to promote environmentally beneficial CHP projects that reflect leadership in helping achieve the national goal of doubling CHP capacity by 2010. Projects can receive either an ENERGY STAR[®] CHP Award or CHP Certificate of Recognition.

The **ENERGY STAR[®] CHP Award** recognizes projects using at least 5% less fuel than separate heat-and-power generation. To apply, projects must have a minimum of 12 months (beginning January to June of the calendar year preceding the application) and 5,000 hours of operating data. Thermal energy must comprise between 20% to 90% of total net system output. In addition, projects must be operating within their emission permit levels.

The **CHP Certificate of Recognition** recognizes efficient CHP projects that demonstrate leadership in environmental performance without achieving the strict award criteria. To apply, projects must be in operating within emissions permit levels but do not require the full 12 month and 5,000 hours of operating data. Projects that demonstrate emerging technologies, fuel diversity, or otherwise advance new markets for environmentally beneficial CHP are candidates for the certificate.

Required Application Information

1. Facility name and address
2. Contact name and information
3. Total gross and net project efficiency (with supporting operating data)
4. Other environmentally beneficial characteristics
5. Signature of responsible official

Process

An EPA/DOE committee will review all applications. The application deadline for the ENERGY STAR Award and CHP Certificate of Recognition is July 1st. Based on the number and type of applications, multiple awards and certificates may be presented at key events.

Recognition

A plaque will be presented to award or certificate winners recognizing the contribution the project is making to expand the development of efficient energy conversion processes. Recognition may also include highlighting winners on EPA and DOE web sites, in press releases, and in case study materials. Awards will be presented at events agreed upon by both the winners and EPA/DOE.

Example Award Efficiency Criteria Assessment

For purposes of the ENERGY STAR CHP Award evaluation process, CHP project efficiency will be compared to highly efficient separate heat-and-power generation (e.g. an onsite boiler and grid electricity). A challenging comparison (for natural gas fueled systems) assumes a 50% efficient natural gas combined cycle electric-only plant (average electric generation efficiency in the United States is 33%) and an 80% efficient steam boiler. To be eligible for consideration, the CHP project must use at least 5% less fuel at the same power-to-heat (P/H) ratio.

Assume, for example, a 100 MW and 1,000,000 lb. steam/hr CHP system.

First, convert to consistent units:

$$\frac{1,000,000 \text{ lb steam}}{\text{hr}} * \frac{(1,200 \text{ btu} - 50 \text{ btu})}{\text{lb steam}} * \frac{1 \text{ MWh}}{3,412,000 \text{ Btu}} = 337 \text{ MW}$$

The energy content of thermal output will vary, but in all situations, the energy content of the makeup water should be subtracted. The energy in condensate return will be considered 100 Btu/lb unless actual measured data is available.

Calculate separate heat and power efficiency (E_{SHP}) from the assumed electric generation efficiency (E_p) and the assumed thermal generation efficiency (E_{TH}):

$$E_{\text{SHP}} = \frac{1}{\frac{\% \text{Power}}{E_p} + \frac{\% \text{Thermal}}{E_{\text{TH}}}} = \frac{1}{\frac{100/(100 + 337)}{0.5} + \frac{337/(100 + 337)}{0.8}} = 70.3\%$$

Calculate award efficiency (E_{Award}):

$$E_{\text{Award}} = \frac{E_{\text{SHP}}}{(1 - \% \text{LessFuel})} = \frac{70.3\%}{(1 - 0.05)} = 74\%$$

For projects with a P/H ratio (power output divided by thermal output) of 0.3 the minimum efficiency to be eligible for an ENERGY STAR CHP Award is 74%. Award eligibility efficiency varies with power-to-heat ratio. The following table shows the minimum award eligibility efficiency (HHV) at different power-to-heat ratios.

P/H Ratio	Separate Heat & Power Efficiency	Award Eligibility Efficiency (5% Less Fuel)
0.11	75%	79%
0.40	68%	72%
1.00	62%	65%
4.00	54%	57%

Different efficiency requirements will apply for projects using fuels other than natural gas. Coal and oil comparisons are 83% efficient thermal and 37% and 45% efficient electric generation respectively. The pulp and paper biomass comparison is 75% efficient thermal and 34% efficient electric generation. For natural gas, coal, oil, and pulp and paper biomass projects less than 100 MW_e the electric efficiency comparison will be 48%, 35%, 43%, and 33% respectively. Projects using other fuels or with other than steam recovery will be compared to the appropriate technology.

Additional Information/Application Materials

Christian Fellner
Climate Protection Partnerships Division
202.564.2664 (phone)
fellner.christian@epa.gov
www.epa.gov/chp

Merrill Smith
Office of Energy Efficiency & Renewable Energy
202.586.3646 (phone)
merrill.smith@ee.doe.gov

ENERGY STAR® CHP Award and Certificate of Recognition Application



All applicants must fill out the information in the space provided.
Supporting documentation with measured operating data is required.

General Information

Company/Organization: _____

Facility name: _____

Facility address: _____

Project startup date: _____

Contact name: _____

Contact title: _____

Contact address: _____

Contact phone: (____) _____

Contact fax: (____) _____

Contact E-mail: _____

Technology Information

	Design Capacity	Single Year Operating Data ¹
Net power capacity	kW	kWh
Net thermal capacity	MMBtu/h	MMBtu
Heat input (HHV)	MMBtu/h	MMBtu
Total net efficiency (%)		

Annual operating hours: _____

% Electricity sold to grid: _____

¹ Supporting documentation of net operating efficiency and calculation method is required. This includes a monthly or quarterly summary of total fuel input, gross energy output, and parasitic losses (gas compressor, fans, etc; do not include energy for distributing thermal output). Any twelve months of consecutive operating data is acceptable (must include all data, not just best 5,000 hours) beginning January to June of the calendar year preceding the application. If, for competitive reasons, detailed operating data is not available enough information should be provided for reviewers to clearly understand how the efficiency calculation was performed.



Technology Information (continued)

While not required, emissions will be evaluated on an output basis and enhance applications.

	Emissions	Data Source
Permitted/estimated NO _x		
Permitted/estimated CO		
Permitted/estimated SO ₂		
Permitted/estimated PM		

Check prime movers and list number and size in description:

- ☐ Gas (combustion) Turbine ☐ Combined Cycle ☐ Steam Turbine
☐ Fuel Cell ☐ IC Engine ☐ Other

Check fuels used and list percentages in description:

- ☐ Natural Gas ☐ Coal ☐ Landfill Gas
☐ Biomass ☐ Oil ☐ Other

Check thermal output uses and describe below:

- ☐ Process Steam ☐ District Heating ☐ Space Heating
- ☐ Space Cooling ☐ Other

Description of project including thermal (with temperature) and electric (or mechanical) energy applications and why the project was an attractive investment:

[illegible]



Innovative Applications and Environmental Benefits

EPA and DOE encourage innovative applications or other CHP projects that offer significant environmental benefits. Examples include direct-mechanical drives, direct heating, and emerging technologies. Use the space below to explain any innovative aspects or additional environmental benefits associated with your project.

[illegible]

If you are interested in learning more about how EPA's CHP Partnership can assist you with CHP projects contact Christian Fellner or look at www.epa.gov/chp.

ENERGY STAR Award winners. Your signature below indicates consent to associate EPA, DOE, and the ENERGY STAR name and logo only with ENERGY STAR CHP Award winning projects and to adhere to EPA's Logo Usage Guidelines.

Signature/Title of responsible official: _____ Date: _____

Please send completed application by July 1st to:

Christian Fellner
Climate Protection Partnerships Division
US EPA (6202J)
1200 Pennsylvania Ave., NW
Washington, DC 20460
202.564.2664 (phone)
fellner.christian@epa.gov

Office Address and Express Delivery:
Christian Fellner
US EPA (6202J)
501 3rd St., NW
Washington, DC 20001
202.565.2079 (fax)

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